

BARIUM COMPOUNDS

CAS Registry Number: 7440-39-3

Ba

Molecular Formula: Ba

Barium is an alkaline earth metal which occurs in yellowish, silver-white, slightly shiny lumps. It is slightly malleable and very oxidizable. Solutions of soluble barium salts are a white powder with sulfuric acid or soluble sulfates (Merck, 1989). The powder may ignite or explode in air or other oxidizing gases and should be stored under inert gas or petroleum (Sax, 1989). Barium is soluble in alcohol and insoluble in benzene (HSDB, 1993).

Examples of Barium Compounds

| | | |
|--|-----------------------|-----------------------------|
| Barium acetate | Barium cyanide | Barium iodate |
| Barium acetylide | Barium cyanoplatinite | Barium nitrate, nitride |
| Barium azide | Barium diazide | Barium oxide |
| Barium benzoate | Barium dichromate | Barium peroxide |
| Barium bromate | Barium ferrite | Barium rhodanide |
| Barium caprylate | Barium fluorborate | Barium silicofluoride |
| Barium carbide | Barium fluoride | Barium stearate |
| Barium carbonate | Barium hydride | Barium sulfate, sulfide |
| Barium chlorate, chloride, chlorite | Barium hydroxide | Barium thiocyanate |
| | Barium hypophosphite | Barium zirconium (IV) oxide |

Physical Properties of Barium

Synonyms: none

| | |
|---------------------------|---------------------|
| Atomic Number: | 56 |
| Valence: | 2 |
| Atomic Weight: | 137.33 |
| Boiling Point: | 1600 °C |
| Melting Point: | 710 °C |
| Density/Specific Gravity: | 3.5 at 20 °C |
| Vapor Pressure: | 10 mm Hg at 1049 °C |

(Merck, 1989; Sax, 1989)

SOURCES AND EMISSIONS

Toxic Air Contaminant Identification

List Summaries - ARB/SSD/SES

September 1997

A. Sources

Barium is emitted mainly from mining and refining industrial processes, in the production of barium chemicals, and as a result of combustion of coal and oil (HSDB, 1993). It is used as a catalyst for organic reactions, as a lubricating oil additive, as rat poison, in the manufacture of paper electrodes, in fireworks, and in electroplating (Proctor, 1991). Barium is also used as a carrier for radium and radioactive barium forms (133, 137M) which are used as standards in gamma spectrometry (Merck, 1989). It is used as a deoxidizer for copper, in Frary's metal, as a lubricant for anode rotors in x-ray tubes, and in spark-plug alloys (Sax, 1987). It is also used in paints, soap, paper and rubber, and in the manufacture of ceramics and glass. However, one of the larger uses is to remove the last traces of gases from vacuum and television picture tubes (HSDB, 1993). The primary stationary sources that have reported emissions of barium compounds in California are electric lighting and wiring manufacturing, office furniture manufacturing, and national security (ARB, 1997b).

B. Emissions

The total emissions of barium compounds from stationary sources in California are estimated to be at least 22,000 pounds per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

Barium is found in the earth's crust at 450 parts per million (ppm) and in seawater at 0.03 ppm. It does not occur free in nature but is found in zinc, barite, witherite, and iron ores (HSDB, 1993).

AMBIENT CONCENTRATIONS

Barium and its species are routinely monitored by the statewide Air Resources Board air toxics network. The network's mean concentration of barium (including its species) from January 1996 through December 1996 is estimated to be 31.4 nanograms per cubic meter (ARB, 1997c).

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of barium and its compounds was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Barium compounds are expected to be particle-associated in the atmosphere, and hence

subject to wet and dry deposition. The average half-life and lifetime for particles and particle-associated chemicals in the troposphere is estimated to be about 3.5 to 10 days and 5 to 15 days, respectively (Balkanski et al, 1993; Atkinson, 1995).

AB 2588 RISK ASSESSMENT INFORMATION

Although barium compounds are reported as being emitted in California from stationary sources, no health values (cancer or non-cancer) are listed in the California Air Pollution Control Officers Association Air Toxics “Hot Spots” Program Revised 1992 Risk Assessment Guidelines for use in risk assessments (CAPCOA, 1993).

HEALTH EFFECTS

Probable routes of human exposure to barium compounds are inhalation, ingestion, and dermal contact.

Non-Cancer: Barium compounds, especially soluble forms such as barium hydroxide and barium oxide, are strongly alkaline and can be injurious to the eyes and skin. Insoluble dusts containing barium may cause local irritation without systemic toxicity. The barium ion interferes with potassium ion utilization and muscular function. This may lead to muscle stimulation, followed by paralysis with tingling in the extremities. Nausea, vomiting, colic, and diarrhea may also occur. In severe cases, loss of tendon reflexes and general muscular paralysis may precede respiratory arrest or ventricular fibrillation (ACGIH, 1992).

Cancer: The United States Environmental Protection Agency and the International Agency for Research on Cancer have not evaluated barium compounds for carcinogenic potential (U.S. EPA, 1995a).

